Hydroxyl Tagging Velocimetry for Rocket Plumes, Phase II

Completed Technology Project (2009 - 2012)

Project Introduction

A non-intrusive method for measuring velocities in a rocket exhaust is proposed in a joint effort by MetroLaser and Vanderbilt University. Hydroxyl Tagging Velocimetry (HTV) uses an ultraviolet laser to tag a region of the flow with OH molecules, and interrogates them after a short delay with a second laser to obtain velocity from time-of-flight data. The method relies on the dissociation of H2O molecules naturally present in the flow, and thus requires no seeding. Being an all-optical technique, it is not adversely affected by high temperatures or high dynamic pressures. Analyses and experiments conducted during the Phase I effort demonstrated feasibility by showing that OH tag lifetimes in a simulated rocket exhaust environment were sufficiently long to enable accurate determination of tag displacements corresponding to typical rocket exhaust velocities. The method was demonstrated by measuring velocities in the exhaust gases of a laboratory scale burner at temperatures and chemical compositions representative of a H2/O2 rocket exhaust. Design tradeoff studies predicted that at measurement ranges of 20 to 50 feet the accuracies would be from two to five percent. This proposal outlines a plan to develop a prototype HTV instrument and demonstrate it in a rocket engine exhaust.

Primary U.S. Work Locations and Key Partners

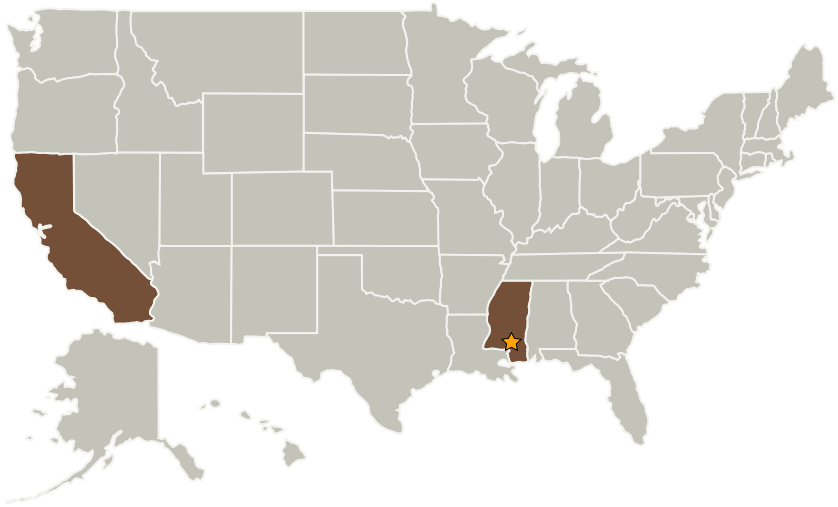

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
MetroLaser, Inc.	Supporting Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Laguna Hills, California

Primary U.S. Work Locations	
California	Mississippi

Project Transitions

June 2009: Project Start

April 2012: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions